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AUTHORITY

30 Nov 1964, DoDD 5200.10; USNSWC ltr, 6 Jan 1976

U S NAVAL PROVING GROUND DAHLGREN. VIRGINIA

REPORT NO. 1048

RESEARCH AND DEVELOPMENT TESTS IN REPORT OF BOMB FUZING SYSTEMS

32nd

ROCKET LAUNCHER TESTS OF ELECTRIC BOMB FUZE EX-200 MOD 3

FINAL Report

MPG-Re2b-20-1-52 Assignment

Copy No. 6

Classification CONFIDENTIAL SECURITY INFORMATION

PART A

SYNOPSIS

- 1. The preceding phase of the test program on the EX-200 Mod 3 electric bomb fuze being developed by the Daystrom Electric Corp. produced the following results:
- a. A satisfactory method of firing 250 lb. low drag bombs from the Naval Proving Ground's 500 ft. launcher.
- b. The extended foil type of condenser functioned satisfactorily when subjected to cross-axial shocks but both types shorted out from shocks in an axial direction.
- c. Two prearmed fuzes in 250 lb. G.P. bombs functioned satisfactorily on 1" STS plate fired at 900 ft./sec. with jiggle switches stiff enough to resist launcher vibrations.
- d. Three EX-200 Mod 3 mock up fuzes (having timing circuits designed to arm the fuze between the end of the launcher and the target) tested for sensitivity in 250 lb. low drag bombs failed to fire upon impact with 1/4" STS plate target.
- 2. This test was conducted to:
- a. Test fuzes with redesigned components intended to correct previous failures plus further development toward completion of fuze design.
- b. Determine the impact sensitivity of the fuze with 35G trigger switches.
- c. Determine the functional ability of the EX-200 Mod 3 fuze to arm and fire after heavy plate impact.
- 3. It is concluded that:
- a. The mock up EX-200 Mod 3 bomb fuze containing a 35G trigger switch (as indicated by the limited number of rounds fired during this test) is sufficiently sensitive to function on $1/16^n$ to $1/8^n$ mild steel targets at a striking velocity of 900 ft./sec.

- b. The previous problem of consistent Condenser-Resistance-Condenser circuit failure during heavy impact tests has been corrected.
- c. Faulty pyrotechnic actuators caused five arming failures during the heavy impact test.
- d. Fuze functioning failure occurred on 1 out of 14 rounds as a result of having the S3 switch held down by extraneous material introduced during target penetration. Bomb Yaw at the time of impact would increase the exposure of the S3 switch to target debris.

4. It is recommended that:

a. The S3 switch be changed so that it can not cause sterilization of the fuze during impact and before the later stages of arming in the event that it is held down by material picked up during target penetration.

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PART B

INTRODUCTION

1. AUTHORITY:

This test was conducted in accordance with references (a), (b), (c), and (d) as authorized by reference (a) under Task Assignment NPG-Re2b-20-1-52.

2. REFERENCES:

- NOL conf ltr NP/NOL/X1-1(1258) WA:NCB:gbh Ser O1811 of 9 Oct 1951
- NOL Work Request WA-3 of 3 Dec 1951
 NOL Work Request WA-4 of 3 Dec 1951
- d. NOL Work Request WA-24 of 18 Mar 1952
- e. NPG Report No. 892 of 17 Dec 1951

3. BACKGROUND:

The preceding phase of the test program on the EX-200 Mod 3 electric bomb fuze being developed by the Daystrom Electric Corp. produced the following results:

- a. A satisfactory method of firing 250 lb. low drag bombs from the Naval Proving Ground's 500 ft. launcher.
- b. The extended foil type of condenser functioned satisfactorily when subjected to cross-axial shocks but both types shorted out from shocks in an axial direction.
- c. Two prearmed fuzes in 250 lb. G.P. bombs functioned satisfactorily on 1" STS plate fired at 900 ft./sec. with jiggle switches stiff enough to resist launcher vibrations.
- d. Three EX-200 Mod 3 mock up fuzes (having timing circuits designed to arm the fuze between the end of the launcher and the target) tested for sensitivity in 250 lb. low drag bombs failed to fire upon impact with 1/4" STS plate target.

4. OBJECT OF TEST:

- a. This test was conducted to:
- (1) Test fuzes with redesigned components intended to correct previous failures plus further development toward completion of fuze design.
- (2) Determine the impact sensitivity of the fuze with 35G trigger switches.
- (3) Determine the functional ability of the EX-200 Mod 3 fuze to arm and fire after heavy plate impact.

5. PERIOD OF TEST:

C.

- a. Date Project Letter
- b. Dates Necessary Material Received
- 9 October 1951
- 3 December 1951
- 26 May 1952
- 4 December 1951

d. Date Test Completed

Date Commenced Test

11 June 1952

6. REPRESENTATIVES PRESENT:

Mr. N. C. Butler Mr. D. K. Tower Naval Ordnance Laboratory Daystrom Electric Corp.

PART C

DETAILS OF TEST

7. DESCRIPTION OF ITEM UNDER TEST:

a. Photographs of the assembled EX-200 Mod 3 fuze and its components are shown as Figures 1, 2, and 3. Figure 4 is a schematic, electrical wiring diagram. The fuze has three electrical initiated pyro-delays which can be selected in accordance with the target.

- b. Component modifications and improvements incorporated in the fuze since date of tests reported in reference (e):
 - (1) Improved high shock condensers.
 - (2) Improved 2 sec. and 4-1/2 sec. pyrotechnic actuators.
- (3) Slight design changes in the top end of the fuze with particular regard to the rod which operates S3 switch to make it less susceptible to water entry and subsequent freezing.
- (4) Improvements in manufacturing processes on various fuze components without radical design changes.
- (5) Steel reinforcement sleeve 1/16" thick placed around the electrical component block to prevent distortion of the block by the heavy top end of the fuze during target impact.
- (6) Booster size reduced and booster cover crimped on instead of threaded on.
- (7) Fuzes hermetically sealed between the fuze housing and bulkhead and between the housing and top end by the Metal-Matic process.
- c. The mock up fuzes fired for target impact sensitivity consisted primarily of Condenser-Resistance-Condenser timing circuits, Victoreen Diode tubes and firing condensers, and primers connected to jiggle switches.
- 8. DESCRIPTION OF TEST EQUIPMENT:

Test Vehicles:

250 lb. G.P. Bomb AN-M57Al Vermiculite-Cement loaded with cross-axial fuze liner midway.

250 lb. Low Drag Bomb EX-2, Vermiculite-Cement loaded. Figure 5

Propelling Force for Test Vehicles:

Y

250 lb. G.P. Bomb-Three 500 rocket motors Mk 2 Mod 3 mounted in special carriage.

250 lb. Low Drag Bomb-Three 500 rocket motors Mk 2 Mod 3 mounted in special carriage with 3025 motor Mk 7 in tail of bomb. The 3025 motor was used primarily to separate the bomb from the carriage.

Launcher:

NPG 500 ft.

Fuze Charging Equipment:

Daystrom Electric Corp.

Targets:

1/32", 1/16", 1/8", 1/4" mild steel, 1/2", 3/4", 1" STS (homogenous armor plate).

7032, $1/16^n$, and $1/9^n$ 24ST aluminum alloy, $1/4^n$, $1/2^n$, $3/4^n$ plywood.

Velocity Measurements:

Counter chronograph and oscillograph.

Cameras:

35mm Mitchell and Bowen Acceleration.

9. PROCEDURE:

- a. Rounds 1 through 21, fired for impact sensitivity, were charged at the muzzle of the launcher; charging voltage was 270 volts D.C. The 3125 separation motors on rounds 1 through 12 were ignited 55 ft. before the end of the launcher.
- b. On rounds 22 through 26 the separation motor was ignited at the muzzle of the launcher.
- c. On rounds 22 through 26 the fuze charging screens were increased in length from $30^{\rm m}$ to $50^{\rm m}$, thus increasing the charging time.
- d. The 17 rounds fired for heavy plate impact had their condensers charged before firing with 200-210 volts D.C. Before each round was fired the fuzes and charging gear were electrically tested.

- e. The first five rounds fired for heavy plate impact were 250 lb. Low Drag Bombs, partially cement loaded. The fuzes contained all components except the tetryl lead-ins and live boosters. They were not hermetically scaled and had threaded booster covers.
- f. The last 12 rounds fired for heavy plate impact were hermetically sealed and had crimped booster covers.

10. RESULTS OF TEST:

- a. Tabulated test results are found in Tables I and II. Detailed impact records are found in Appendix (B).
- b. Results of the sensitivity test were rather inconclusive due to the small number of rounds fired. However, using a 35G switch, a 1/16" or 1/8" mild steel target was sufficient to cause detonation of more than 50% of the fuzes fired at them, Figure 6.
- c. During the sensitivity tests two fuzes with 35G switches detonated prematurely, approximately 25 ft. before the target. This may have been caused by excessive vibration in the bomb built up during its flight down the launcher or possibly as a result of an interruption in the burning of the 3725 separation motor in the tail of the bomb. Such interrupted burning might produce a deceleration in the round.
- d. On many of the sensitivity tests two targets were used. A thin target was placed at 200 ft. from the launcher muzzle and a heavier one at 250 ft. was certain to provide sufficient deceleration to cause the fuze to function. Consequently, the number of rounds fired, as shown in the tables, do not correspond to the number of target results indicated.
- e. Most of the dud rounds occurring on 1/16", 1/8" and 1/4" mild steel targets resulted during a period in which it is believed there may have been some fault in the fuze charging method. Several changes in the charging method (but not in the fuzes), prior to the last 5 rounds fired, resulted in successful functioning on targets which had previously produced duds.
- f. Additional tests of target sensitivity will be conducted during the evaluation program.

g. Summary of Heavy Impact Test (in 250 lb. G.P. bombs)

No. of Rounds	STS Target	Striking Velocity	Fuze Delay Arming	Funct HO	ze ioning <u>Dud</u>
5	170	Average 900 ft./sec.	Approx. 10 sec.	2	3
6	3/4"	Average 900 ft./sec.	Approx. 10 sec.	2	4

Note: One round fired against 1^m STS was not recovered and is not listed in above results.

(1) A study of Table II (Heavy Plate Impact Test) shows that the charging procedure was not the cause of the seven duds. The defect in five appears to be a failure of the pyrotechnics to operate their respective switches. In one case the Condenser-Resistance-Condenser circuits may have failed. The last failure may have been caused by the discharging of part of the Condenser-Resistance-Condenser circuit energy through the S3 switch which was held down by wood from the target impact. The recovered fuzes have been delivered to the Naval Ordnance Laboratory for further investigation. Figure 7 shows a typical round in flight during the heavy impact test.

PART D

CONCLUSIONS

ll. It is concluded that:

- a. The mock up EX-200 Mod 3 bomb fuze containing a 35G trigger switch (as indicated by the limited number of rounds fired during this test) is sufficiently sensitive to function on 1/16" to 1/8" mild steel targets at a striking velocity of 900 ft./sec.
- b. The previous problem of consistent Condenser-Resistance-Condenser circuit failure during heavy impact tests has been corrected.

- c. Faulty pyrotechnic actuators caused five arming failures during the heavy impact tests.
- d. Fuze functioning failure occurred on 1 out of 14 rounds as a result of having the S3 switch held down by extraneous material introduced during target penetration. Bomb Yaw at the time of impact would increase the exposure of the S3 switch to target debris.

PART E

RECOMMENDATIONS

12. It is recommended that:

a. The S3 switch be changed so that it can not cause sterilization of the fuze during impact and before the later stages of arming in the event that it is held down by material picked up during target penetration.

The tests upon which this report is based were conducted by: F. W. KASDORF, Rocket Battery Officer
Rocket Battery
Terminal Ballistics Department

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Commander, Naval Proving Ground

E. A. RUCKNER Captain, USN

Ordnance Officer

By direction

P. S. NAVAL IROVING GROUDS DARLGREN, VERGIDIA

Thirty-Second Partial Report

on

Research and Development Tests in Report of
Bomb Fuzing Systems

First Partial Report

on

Rocket Launcher Tests of
Electric Bomb Fuze EX-200 Mod 3

Project No.: NPG-Re2b-2C-1-52

Copy No.: 6
No. of Pages: 11

CONFIDENTIAL SECURITY INFORMATION

Date: MOV 12 1952

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DESTINE DEPOSATION

AFPENDIX A

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IMPACT RECORD

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Bomp Somb	eact test of electric bomb	ruze in 250 is. o. r.
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PLATE TARGET	FC MB	ROCKET
Gage 0175 Class	STS HEAD: Cal.	Type G. P. Bomb
Maker U.S. Steel	Mark M57 M	lod No. WE.250.0#
No. 0157663 Group U		
Dimensions 83-1/2" x	250" Lot No.	
	Filler: Typ	oo Verm Wt
OBLIQUITY Oc	Puzes Ex-	-200 Mod 3 No 1315
PENETRATION Complete	Boosters	2
Thickness at impact	775 Wt. of head	(as fired) 250.0#
No. of impact on plate	3	
Dist. from nearest imp	act 47" MOTOR: Cal.	5" Mk. 2 Mod 3
Dist. from near edgesty	.6"andL118" Motor temp.	90° %t. 80.90#
Impact area 13" x 2		
Spall: Front 0 B	ack 0 COMPLETE ROUND): MarkMod
DishSpur_	/" Wt. (as fire	330.90/
Cracks 0	Wt. (burned)	
Punching (throva) (st	arted)	17 AM
Back Button (threvn)	STATIST OTHER INFORMAT	MION RMDA-119-HA-45
Bulge		M 11 11
Through opening 12"	X 19"	" -987- " ft Launcher
		TE Launcher
	ROCKET PERFORMANCE	
Flight	Mean Velocity, f/s: Stracking	911 Residual
Fuze functioning	TOTOGOTOS, 1/8: OUNDERING	/ neoluudi
Explosive action (High	Order) (Low Order) (None)	
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Condition of recovered r		
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IMPACT RECORD

U.	S. NAVAL PROVING GROUND	IMPACT NO. 39967
	DAHLGREN, VIRGINIA	IMFACT DATE 5-27-52
		NPG TEST NO. T-2219-1.

OBJECT Impact test of	electric bomb fuze in 250 lt. G.P. Bomb
Reference: NPGNN1+ Perort No.	1048 dated
Reference: Browd ltr. NI/N 1./X1-1(1258)	MA: NOS dated _ r [] 2] of 9 Oct 1951
Task Assignment No. http://doi.org/1012101	dated 4 Aug 1951
PLATE TARGET	BOMB ROCKET
Gage 0775 Class STS	HEAD: Cal. Type G. P. Bomb
Maker U. 3. Steel	Mark 1157 Mod No. Wt. 250.0#
No. 0157663 Group U-\$26-832	Maker
Dimensions 83-1/2" x 250"	Lot No.
AD 1 1 A 22 May	Filler: Type Verm. Wt.
OBLIQUITY 0.	Puzes Ex-200 Mod 3 No. 1715 w/ primers and dets.
PENETRATION Complete	Boosters 2
Thickness at impact "75	Wt. of head (as fired) 250.0#
No. of impact on plate	
Dist. from nearest 'mpact 42"	MOTOR: Cal. 5" Mk. 2 Mod 3
Dist. from near edgesT48"andL160"	Motor temp. 90° Wt. 80.85#
Impact area 18" x 48"	
Spall: Pront 0 Back 0	COMPLETE ROUND: Mark Mod
Dish 4" Spur 3"	Wt. (as fired) 330.85#
Cracks	Wt. (burned)
Punching (thrown) (started)	CATURE TWENDMANTON DY'NA CA IIA LE
Back Button (thrown) (started)	OTHER INFORMATION RMDA-56-HA-45 "-119-"
Bulge 0 Through opening 17" x 47"	
Im ough opening 27 - 47	LAUNCHER 500 ft. Launcher
	200 201 200
ROCKET PE	RPORMANCE
	Mean
Plight Velocity f/	s: Striking 927 Residual
Puze functioning in the house	to the director
Explosive action (High Order) (Lov Distance of burst behind plate	Order) (None)
Condition of recovered round	
Head was in	(EPPECTIVE) (IMEPPECTIVE) condition.
REMARKS: Sent set for 12	1 110 - 2 11 H1 2 - 11d.
2 sec, existing (her S. sixtely i)	med to see actestor lived 5, closed
U see solver fixed	
	F. W. Kasdon In a
Photo No.	Signed Signed
CONFIDENTIAL	R. T. CROWELL, 1h Ord. Eng.
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SHOWNITY II A TIN	

IMPACT RECORD

COMFIDENTIAL

U. S. NAVAL PROVING GROUND IMPACT NO. 39968 DAULGREN, VIRGINIA

	IMPACT DATE 3-27-32
	NPG TEST NO.T-2219-1.8
OBIECT Impact test of e	lectric bomb fuze in 250 lb. G.P. Bomb
OBSECT Impact of the	1004110 0000 1420 1 4/0 204 0111 0000
Reference: MPQ was Fin. Report No	1048 dated
Reference: BROWN 1tr. Peport No Reference: BROWN 1tr. NF/10L/X1-1(1258)	MA:NCB datedSer 01811 of 9 Oct 1951
Task Assignment No.NiG-Re2b-20-1-52	dated 4 Aug 1951
PLATE TARGET	ROCKET
TIME TANGET	BOMB
Gage 0775 Class STS	HEAD: Cal. Type G.P. Bomb
Maker U. S. Steel	Mark M57 Mod No. Wt. 250.0#
No. 0138073 Group U-526-822	Maker
Dimensions 90" x 250"	Lot No.
ODI TOTT EN	Piller: Type Verm, Wt.
OBLIQUITY 0°	Puzes Ex-200 Mod 3 No 1224
PENETRATION Complete	w/primers and dets.
Thickness at impact #75	Boosters 2 Wt. of head (as fired) 250.0#
No. of impact on plate 3	. we. of field (45 fired)
Dist. from nearest impact 49"	MOTOR: Cal. 5" Mk. 2 Mod 3
Dist. from near edgesT46"andL138	
Impact area 16" x 22"	
Spall: Front O Back O	COMPLETE ROUND: MarkMod
Dish 3" Spur 13" Cracks 0	Wt. (as fired) 328.60#
Cracks 0	Wt. (burned)
Punching (thrown) (started)	
Back Button (thrown) (minried)	OTHER INFORMATION RMDA-1020-HA-45
Bulge 0	" = 957= " " = 901= "
Through opening 15" x 21"	
	LAUNCHER 500 ft. Launcher
ROCKET PI	ERFORMANCE
1.00.22	Mean
Flight Velocity, f	
Puze functioning	
	Order) (None)
Distance of burst behind plate	
Condition of recovered round	INTACT
Barro Hond Vas Ix	(EPPECTIVE) (ENEPPECHIVE) condition.
DEMARKS. //	-: 1- 1 11 11 111 12
REMARKS: hale wines in the	- A recombination of the first the second
- is citize to be a line of land	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
	IW Vandanto
Photo No.	Signed F.W. Kasasy for RTC
The second secon	R. T. CROWELL, 1h
CONFIDENTIAL	Ord. Eng.
a mit of the New Year	**************************************

IMPACT RECORD

CONFIDENTIAL

U. S. NAVAL PROVING GROUND DAMLGREN, VIRGINIA

IMPACT NO. 39969

IMPACT DATE 5-27-52

	IMPACT DATE 7-27-72
	NPG TEST NO.T-2219-1.8
OBJECT Impact test of	electric bomb fuze in 250 lt. G.F. Bomb
Reference: MPG The Penant 1/	1048 dated
Reference: MPG 1258. Perort // Reference: ANOROX 1tr. 15/101/X1-1(1258)	Akilios dated Ser Civil of 9 Oct 1991
Task Assignment No. MiC-Re2b-2:-1-52	dated 4 May 1991
	<u></u>
PLATE TARGET	ROCKET
	BOMB
Gage 100 Class STS	HEAD: Cal. Type G. P. Bomb Mark N:57 Mod No. Wt. 250.0#
Maker Lukens	Mark 1157 Mod No. Vt. 250.0#
No. #50 Group L-30	Maker
Dimensions 96" x 348"	Lot No.
	Filler: Type Verm. Wt.
OBLIQUITY O.	Puzes Ex-200 Nod 3 12/2/6
	w/primers and dets.
PENETRATION Complete	Boosters 2
Thickness at impact 170 No. of impact on plate 3	Wt. of head (as fired) 250.0#
No. of impact on plate 3	
Dist. from nearest impact 0	MOTOR: Cal. 5" Mr. 2 Mod 3
Dist. from near edges T49 and R57"	Motor temp. 90° Wt. 80.75#
Impact area 17" x 23"	•
Spall: Pront 0 Back 0	CONPLETE ROUND: MarkMod
Dish 4" Spur 1"	Wt. (as fired) 330.75#
Cracks	Wt. (burned)
Punching (thrown) (started)	D''DA OCC TIL
Back Button (threvn) (adapted)	OTHER INFORMATION RUDA-987-HA-45
Bulge C	" -1025- "
Through opening 16-1/4" x 22-1/4	н _ н _ н
	LAUNCHER 500 ft. Launcher
TANKER DE	DOMANNA HAD
HUURET PE	RPORMANCE
Diante Ci	Mean /s: Str iking _ 940 Residual
The state of the s	s: Striking 940 Residual
Puze functioning Resource (Low Explosive action (High Order) (Low	Order) (None)
Distance of burst berind plate	order) (none)
Condition of recovered round	Intaci-
L'a Mar Vas In	
7. 22. 7000 100 11	(MIDDITED) (INDIFFECED) COMMITTEE
REMARKS:	The state of the second
The state of the s	the state of the s
- Hayle Wicold	
	EW Video 10
Photo No.	Signed T. W. Koldon
THOU NO.	R. T. CROWELL. 1H
CONFIDENTIAL	Ord. Eng.
1/	
A MINISTER IN CONTROL	

IMPACT RECORD

U.	3.	NAV	AL	PR	OV	II	IG	GROUND
	DA	HLG	REN		VI	RC	IN	IIA

IMPACT	NO	39972	
IMFACT	DATE_	5-28-52	
NDO MEG	·m = ^	-2210-1	ø

	NPG TEST NO.T-2219-1.8
OBJECT Impact test of 250# G. P. Bomb	Ex-200 Electric Bomb Fuze in
	10-18 dated
Reference: YRAQLO ltr NPA n. 31-1(11.56)	the datedSer Olsil of 9 oct 1951
Task Assignment No. N D-Le2b-2U-1-52	dated 4 Aug 1951
PLATE TARGET	BOMB ROCKET
Gage 1,0 Class STS	HEAD: Cal. Type G.P. Bomb
Maker Lukens	Mark N.57 Mod No. Wt. 250.0#
No. 50 Group L-30	Maker -
Dimensions 96" x 348"	Lot No.
	Piller: Type Verm., Wt.
OBLIQUITY Or	Puzes Ex-200 Mod 3 #1078, with
00-104	primers and detonators
PENETRATION Complete	Boosters 2
Thickness at impact 1"0	Wt. of head (as fired) 250.0 m
No. of impact on plate 4	MOMOD. Call 5 Min C Mod 2
Dist. from nearest impact 42"	MOTOR: Cal. 5 Mk. 2 Mod 3
Dist. from near edgesT42"andL152" Impact area 14" x 23"	Motor temp. 95° Vit. 80.65#
Spall: Front 0 Back 0	COMPLETE ROUND: Mark Mod
Dish 3" Spur 5"	Wt. (as fired) 330.65#
Cracks 0	Wt. (burned)
Punching (thrown) (started)	, , , , , , , , , , , , , , , , , , , ,
Back Button (thrown) (started)	OTHER INFORMATION RMDA-619-HA-45
Bulge 0	" -56-li-45
Through opening 12" x 21"	" -100- "
	LAUNCHER 500 ft. Rocket Launcher
ROCKET PER	
	Mean
Flight Velocity, f/s	
Puze functioning A de -	-
Explosive action (High Order) (Low C	Order) (None)
Distance of burst behind plate	
Condition of recovered round	Titacit
Head Vas In	(EPPECHIVE) (1
REMARKS: 11 ser primer find	into looster, Fige armed
Photo No.	Signed)
FILORO BO.	R. T. CROWELL. Th
	Ord. Eng.
CONFIDENTIAL SECURITY INFORMATION	

IMPACT RECORD

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U. S. NAVAL PROVING GROUND DAHLGREN, VIRGINIA

IMPACT	NO	39973
IMPACT	DATE_	5-28-52

	NPG TEST NO. T-2219-1.8
OBJECT Impact test of E	x-200 Electric Bomb Fuze in
250# C.P. Bomb	
Reference: MPG NOTE. Peport No	. 1048 dated
Reference: Buttilitr. NF/HUL/AL-1(1258)	dated Ser CISIL of 9 Oct 1951
Task Assignment No. N:U-Re2b-2U-1-52	dated 4 Aug 1951
PLATE TARGET	BOMB ROCKET
Gage 170 Class STS	HRAD: Cal. Type G.P. Bomb
Maker Lukens	HRAD: Cal. Type G.P. Bomb Mark M57 Mod No. Wt. 250.0#
No. 50 Group L-30	Maker -
Dimensions 96" x 348"	Lot No
	Piller: Type Verm. Wt.
OBLIQUITYO°	Fuzes Ex-200 Mod 3 #1073 with
	primers & dets
PENETRATION Complete Thickness at impact 100	Boosters 2
Thickness at impact 100	Wt. of head (as fired) 250.0#
No. of impact on plate 5	
Dist. from nearest impact 35"	MOTOR: Cal. 5" Mk. 2 Mod 3
Dist. from near edges 18 and 115"	Motor temp. 95° Wt. 80.10#
Impact area 18" x 39"	
Spall: Front 0 Back 0	COMPLETE ROUND: MarkMod
Dish 5" Spur 34"	Wt. (as fired) 330.10#
Cracks 0	Wt. (burned)
Punching (thrown) (started)	
Back Button (threvn) (startes)	OTHER INFORMATION RMDA-957-HA-L5
Bulge 0	" -100-H-L5
Through opening 16" x 36"	7 1 1
	LAUNCHER 500 ft. Rocket Launcher
ROCKET PE	RPORMANCE
	Mean
PlightVelocity, f/	s: Strong 939 Residual
Puze functioning	
Explosive action (High Order) (Low	Order) (None)
Distance of burst behind plate	
Condition of recovered round	2 mat recover
Head Vas in	(EFFECTIVE) (IMEFFECTIVE) condition.
REMARKS: 3400 and second	lead ,
	DTA 11
Photo No.	Signed Of Comment
_	R. T. CROWELL, 1h
CONFIDENTIAL	Ord. Eng.
SECURITY INFORMATION 6	

IMPACT RECORD

	DAMLGREE, VIRGINIA	IMPAUT NO. 39999
	DALLORDS, VIRUINIA	IMPACT DATE 6-9-52
		NPG TEST NOT-2219-1.8
OBJECT Impa	ot Test of EX-200 Flactric	Bomb Puza in 250#
Reference: RFGA Lieu. RF/R	017/A1=1112363:(A:Kc)	Ser Oldin of 7 986 1991
Reference: BuOrd ltr.	n-ch-on 1 to	ated Ser Orell of 7 oce 1991
Reference: Buord Itr.		
TASK ASSIGNMENT NO.	Q.	ated
PLATE TARGET	Peport No. 1048	ROCKET
Oage 140 Class	STS HRAD: Cal.	5" Type G.P. Bomb
Maker Lukens	MAPE ANN 57 M	od_Al_NoWE255.00#
No. 50 Group		
Dimensions 96" X 3	ge Lot No.	
	Filler: Typ	
OBLIQUITY 0°	Puzos RY-2	200 Mod. 3 No 110.3
	w/Prime	r. Det. & Arming Squibs
PENETRATION Complet	Le Boosters_	2
Thickness at impact	Wt. of head	(as fired) 255.00
No. of impact on plate	6	
Dist. from nearest impa	ct 12" MOTOR: Cal.	5 Mk. 2 Nod 3
Dist. from near edges 5	And 72H Motor temp.	120° Wt.81.30#
Impact area 15" X	200	TEV The BLASTE SUF
enalls Prome ()	OF O COMPLETE BOTTON	. Mark Had
Spall: Front 0 Be	COMPLETE ROUND	: Nark Nod
Dish 3" Spur	Wt. (as rire	4) 336.30#
Crecks 0	Wt. (burned)	
Punching (thrown) (sta	rted)	
Back Button (thrown) ke	tested other informat	ION AIN: RMDA-LL-MCA-L5
Bulge		45 RMDA=695=HA=45
Through opening 13.	-1/2" X 35"	
- Vancous Maria	LAUECHER 1050	Rocket Launcher
	(50)	
	ROCKET PERFORMANCE	o·)
	Mean	
Middle Ross		PLL Residual
		Residual
	not armi	
Explosive action (High		
Distance of burst behind		
Condition of recovered ro		
Bom	Book vas in (KPVECTIVE) (T	condition.
REMARKS: Sa switch forms	1. zac actistos list. sa	entitled 48 aco
	a Sa dil not claria. Il sac	Phimas diag
- ECHALES AND BEILD		
	Lino:	
Photo No.	Signed F.W	Kaster
		d
CONFIDENTIAL		F.W.Kasdorf
SECURITY INFORMATION	7	
	•	UDD BILL

CONFIDENTIAL SECURITY INCOMMATION

CONFIDENTIAL

IMPACT RECORD

	PROVING GROUND N. VIRGINIA	IMPACT NO. 40000
	n, vindinin	IMPACT DATE 6-9-52
•		NPG TEST FO.T-2219-1.8
OBJECT Papact Test of I	1-200 Electric J	Somp Fuze in 2504
J.P. Bomb va 100 J	Plate.	
Reference: MPG 12. Report No	. 1048 de	ted
Reference: EngleLitr. NE /NOT /V1 1/1250	VA. NCB	ted Sar (1811 of 9 Oct 1951
Task Assignment No NPG-Re2b-20-1-52	de	ted Aug 1951
PLATE TARGET	•	ROCKET
Gage 100 Class STS	HRAD: Cal.	5" Type G. P. Bomb
Maken	Mark ANN 57 Ho	od Al No. Vt. 252.00#
No. 0/3796 Group Dimensions 8'9" A 18'4" A 1"	Maker	
Dimensions 8'9" A 18'4" A 1"	Lot No.	
	Filler: Type	
OBLIQUITY O°	Fuzes EX-2	00 Mod.3 No 1208
	i/Pr	imer. Det. & Arming Squibs
PENETRATION Complete	Boosters	250
Thickness at impact 100	WE. OI HEED	(as fired) 252.00#
No. of impact on plate 7 Dist. from nearest impact 0	MOTOR. Cal 5	" Mk. 2 Mod 3
Dist. from near edges of and 76"	Motor temp	120° Wt. 79.95#
		120 11.79.95#
Impact area 12" x 21" Spall: Front 0 Back 0	COMPLETE ROUND	NarkMod
Dish 2" Spur 2"	Wt. (as fire	331.95#
Cracks	Wt. (burned)	
Punching (thrown) (started)		
Back Button (thrown) (akartest)	OTHER INFORMAT	ON_ALN:RMDA-22-HA-L5
Bulge Q		" -880-HA-45
Through opening 11" % 20-1/2"		" -1240-HA-45
		50' Rocket Launcher
	(5)	001)
ROCKET PR	RFORMANCE	
Flight Velocity, f/	Ke un s: Birding o	Residual
Flight Velocity, f/ Fure functioning	s: Emarring q	18 Residual
	Order) (None) :	
Distance of burst behind plate		
Condition of recovered round	INTACT	
Bomb Hood Vas In	(EFFECTIVE) (EX	condition.
REMARKS: 2 sec artists find 5	mith closed	4k see artestor did
Photo No.	Signed F.W.	Karden
	<u></u>	F.W.Kasdorf
	- St	OUN ENG

IMPACT RECORD

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U. S. NAVAL PROVING GROUND DAHLGREN, VIRGINIA

IMPACT NO. 40005

IMPACT DATE 6-10-52

NPG TEST NO. T-2219-1.8

OBJECT Impact test of	Ex-200 Electric Bomb Fuze in
250# G. P. Bomb	
Reference: MPGNac 1tr. Meport No	1048 dated
adierence: Spera itr.	<u>aatea</u>
Task Assignment No.	dated
NEXXX NF/NOL/X1-1(1258) PLATE TERGET 2b-20-1-52	A:NCH Ser Oldll of 9 Oct 1/51 BOMB BOMB
Gage 1"0 Class STS	HRAD: Cal. Type G. P. Bomb
Maker CARNEGIE	Nark ANM 57 Mod A-1 No. Wt. 250,00#
No. 043796 Group	Maker
Dimensions 105" x 220"	Lot No.
X.CX	Filler: Type Verm Wt.
OBLIQUITY O°	Puzes Ex-200 Mod 3 with primers
	Dets and armine squids No 1053
PENETRATION Complete	Boosters 2
Thickness at impact 1"0	Wt. of head (as fired) 250.00#
No. of impact on plate	
Dist. from nearest impact 44"	MOTOR: Cal. 5" Mk. 2 Mod 3
Dist. from near edgers, "and 1100	Motor temp. 120° Wt. 79.10#
Dist. from near edges 3/4 and 1100 Impact area 32" x 12"	
Spall: Front - Back -	COMPLETE ROUND: Mark Mod
Dish 3-1/2" Spur -	Wt. (as fired) 329.10#
Cracks -	Wt. (burned)
Punching (thrown) (started)	
Back Button (threvn) (started)	OTHER INFORMATION RMDA-695-HA-45
Bulge -	
Through opening 31" 4 11-1/2"	
Through opening 31 I 11-172	LAUNCHER 500 It. Launcher
	RFORMANCE Lean
Flight Velocity, f/	s: Striking 753 Residual
Puze functioning	
Explosive action (High Order) (Lov	Order) (None)
Distance of burst behind plate	
Condition of recovered round Head Vas in	(RPPECTIVE) (INEPPECTIVE) condition:
REMARKS: 2 see actuation filed. 5	witch open to see actuator did
the possible till the pure	telm leskel a bell chance
	FW Karden 100
Photo No.	Signed 7. M. March of For RTC
	R. T. CROWELL 1h
CONFIDENTIAL	Ord, Eng.
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IMPACT RECORD

	AL PROVING GROUND	IMPACT NO. 40006
DAMLG	REN, VIRGINIA	IMPACT DATE 6-10-52
		NPG TEST NO. T-2219-1.8
OBJECT Impact test 250# G. P. Som	of Ex-200 Electric	Bomb Fuze in
	برواناها والمرابع والمترافع والمرابع والمرابع والمرابع والمرابع والمرابع والمرابع والمرابع والمرابع	
Reference: NPGNoLltr. Report	100 1048 da	ted
Reference: Buord ltr.		ted
Task Assignmentino. RP/HCL/X1=1(12)	CONTRACTO CO	ted or 01611 of 9 Cot 1951
PLATE TARGET	Bomb	ROCKET 1951
Gage 0778 Class STS	HEAD: Cal.	Type G.P. Bomb
Maker Lukens	Mark ANM 57 Mo	d A-1 No. WE. 250.00#
Maker Lukens No. /1 Group L 21	Maker	
Dimensions 96" x 348"	Lot No.	
	Filler: Type	Verm. Wt.
OBLIQUITY30°	Puzes Ex-	200 Mod 3 with primers
	dets.	and arming squids No 102
PENETRATION Complete	Boosters 2	
Thickness at impact 0778	Wt. of head (as fired) 250.00#
No. of impact on plate 3		
Dist. from nearest impact		5" Mk. 2 Mod 3
Dist. from near edges[35"and[106	Motor temp.	120° Nt. 79.50#
Impact area 40" x 20-1/2"		
Spall: ProntBack	COMPLETE ROUND:	MarkMod
Dish 4 Spur - Cracks -	Wt. (as fired	329.50#
Cracks -	Wt. (burned)	
·Punching (thrown) (started)		
Back Button (thrown) (planted)	OTHER INFORMATI	ON REDA-400-McA-45
Bulge		" -426 - HA - 45
Through opening 21" x 35"		" -833-IIA-45
	LAUNCHER 500	ft. Launcher
ROCKET	PERFORMANCE	
	f/s: Striken 9	F1
Plight Velocity,	r/s: straining 9	54 Residual
Puze functioning		
	w Order) (None)	
Distance of burst behind plate		
Condition of recovered round	MACT	MARAMYMAT
Head Vas	in (EFFECTIVE) (INE	PPECTIVE) condition.
REMARKS: 2 see actiontes fine	d. S. switch open	4/3 se artusta
Othis possessed that the A	water burn La Ray	a full class a
	=10	Walles 10
Photo No.	Signed 7-	COCKET FORD TO
		ROWELL CLH
CONFIDENTIAL	ORD. EN	
SECURITY INFORMATION /0	73.25	

IMPACT RECORD

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U. S. NAVAL PROVING GROUND DAHLGREN, VIRGINIA

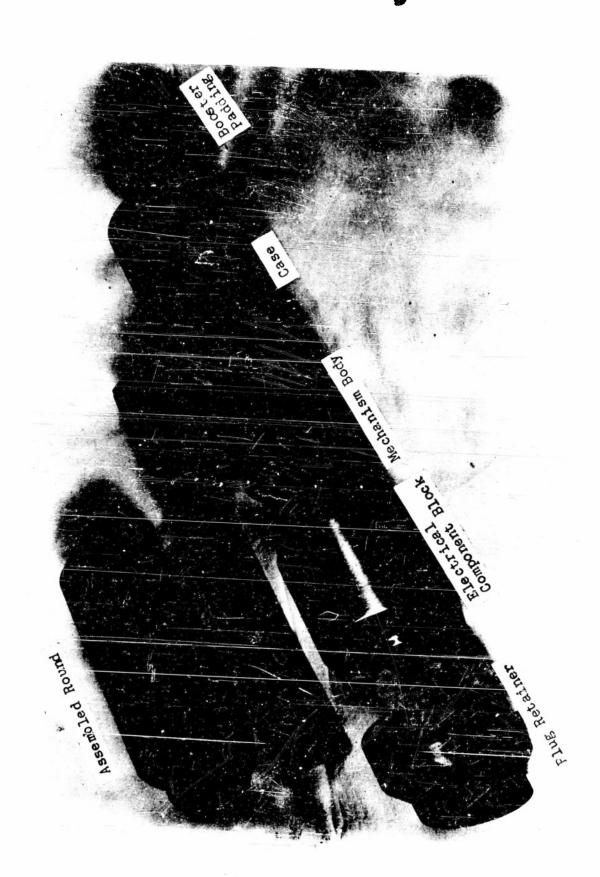
IMPACT NO. 40007

IMPACT DATE 6-11-52

	NPG TEST NO.T-2219-1.8
OBJECT Impact test	of Ex-200 Electric Bomb Fuze in
250# G. P. Bomb	
Reference: NPGNoLler. Report 1/6	
Reference: BuOrd 1tr.	dated
Task Assignment No.	dated
MP/P A 1-11/1/	76A1KON 30F-01K11 01 7 90V-1951-
PLATE TANGET 26-25-1-52	Bemb Rocker 1931
O O O O O O O O O O O O O O O O O O O	
Gage 0.78 Class STS	HEAD: Cal. Type G.P. Bomb MarkANN:57AMod No. Wt. 25C.00#
Maker <u>Lukens</u> No. 41 Group L21	Markanis7A Mod No. Wt. 250.00#
No. 41 Group Lai	Maker
Dimensions 96" x 348"	Lot No.
OBLIQUITY 45°	Piller: Type Verm. Wt.
OBLIQUITI 47	Puzes Ex-200 Nod 3 No 1072
DEWERRO ARTON Complete	(explosive unknown)
PENETRATION Complete	Boosters 2
Thickness at impact 0778	Wt. of head (as fired) 250.00#
No. of impact on plate 4	** MOMOD. 0-1 58 Mb. 2 Mad 2
Dist. from nearest impact 115"	
Dist. from near edges T58 and R45"	Motor temp. 120° wt. 82.30#
Impact area 16" x 45" Spall: Front 0 Back 0	COMPLETE ROUND: Mark Mod
Spail: Front U Back U	
One of Spur 1/"	Wt. (as fired) 332.30# Wt. (burned)
Spall: Front 0 Back 0 Dish 5" Spur 17" Cracks 0 Punching (thrown) (started)	wt. (burned)
Punching (thrown) (started) Back Button (thrown) (started)	OTHER INFORMATION RMDA-1240-HA-45
Bulge 0	-400-LCA-45
Through opening 15" x 43"	" -991-HA-45
Illiough opening 1) X 4)	LAUNCHER 500 ft. Launcher
	Thought 500 It. Launcher
ROCKET P	ERFORMANCE
	. Mean
Plight Velocity, f	/s: Standing 946 Residual
Puze functioning	
Explosive action (High Order) (Low	Order) (None)
Distance of burst behind plate	
Condition of recovered round	INTACT
Head Vas 1	n (EPFECTIVE) (condition.
	1 0 0
REMARKS: 2 sec selector fired	S suitch partially closed 42 sec
actuator did not fine so	rom User Assmer Usid not sie
It is possible that the	Desota lines lacked a full chance
	F. W. Kasdon La
Photo No.	Signed
	R. T. CROWELL, 1h
CONFIDENTIAL	Ord. Eng.
SECURITY INFORMATION //	

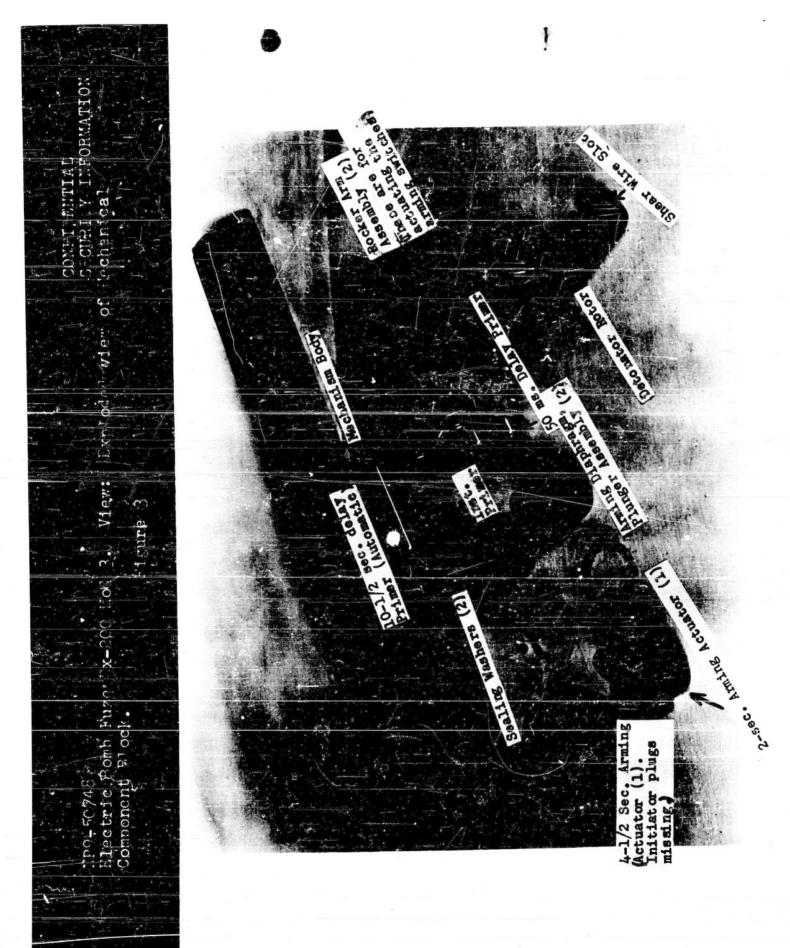
IMPACT RECORD

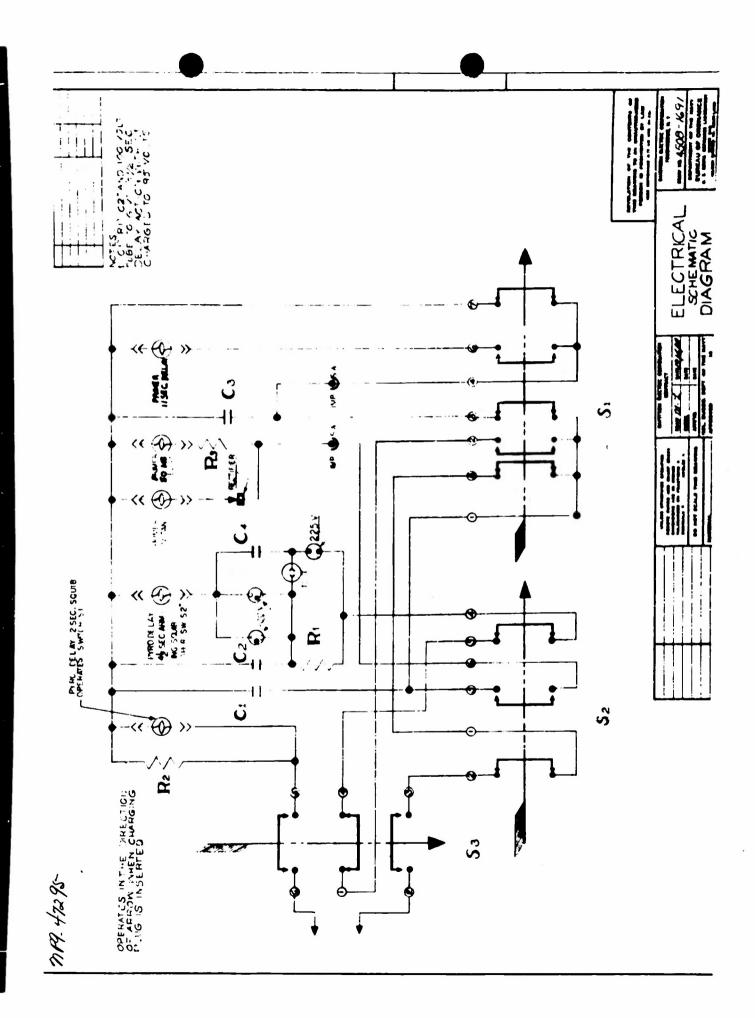
	T MINOR OR OND IMPACT NO. 4000
DARLGRE	IMPACT DATE 6-11-52
	NPG TEST NO. T-2219-1.8
OBJECT Impact test of G. P. Bomb	Ex-200 Electric Bomb Fuza in 250#
Reference: NPG. 1tp. N. Proper T. N.	0.1049 dated WA-MCR dated Cor C1811 of 9 let 1951 dated Aug 1951
Reference: Aucko ltr. NPAN Y1-1(1258	Wayner dated con Clair of Court 1057
Task Assignment No. NEC-E-2b-2c-1-52	dated_/_Aug_1951
PLATE TARGET	Bomb ROCKET
Gage 0978 Class STS	HRAD: Cal. Type G. P. Bomb
Gage 0:78 Class STS Maker Lukens No. 41 Group L21	HRAD: Cal. Type G. P. Bomb MarkANM57AlMod No. Wt. 250.0C#
No. 13 Group 121	Maker
Dimensions 96" x 348"	Lot No.
30 A)40	Pillan, Tyna Vang Vi
OBLIQUITY 45°	Puzes Ex-200 Fod 3 /4/2 44
	Fuzes Ex-200 Kod 3 No. 12.34 (explosive unknown)
PENETRATION Complete Thickness at impact C.78 No. of impact on plate 5 Dist. from nearest impact 63"	Boosters 2
Thickness at impact 6778	Wt. of head (as fired) 250.00#
No. of impact on plate 5	,
Dist. from nearest impact 63"	MOTOR: Cal. 5" Mk. 2 Mod 3
	MOTOR: Cal. 5" Mk. 2 Mod 3 Motor temp. 120° Wt. 80.85#
Impact area 17" x 34" Spall: Front 0 Back 0 Dish 4" Spur 13"	
Spall: Front O Back O	COMPLETE ROUND: MarkNod
Diah / " Spur 13"	Wt. (as fired) 330.85#
Cracks 0	Wt. (burned)
Punching (thrown) (started)	
Back Button (threwn) (started)	OTHER INFORMATION RMDA-957-HA-45
Bulge 0	" 1020-HA-45
Through opening 16" x 29"	H 11 H
0.6. 070-0	LAUNCHER 500 ft. Launcher
ROCKET PE	RPORMANCE
Plight Velocity, f/	/s: Striking 952 Residual
Puze functioning Pull Explosive action (High Order) (Low	Order) (None)
Distance of burst behind plate	order) (none)
Condition of recovered round	Intact
Head Vas In	
11062 460 12	(MITBOILVE) (IMMERIQUE) CONGICTOR.
REMARKS: So switch functioned	but did not assent a suite
1) Ale asimas distant	to possible that the according
Land a faill bear	THE PERSON NAMED AND PARTY AND ADDRESS OF THE PERSON NAMED AND
The state of the s	FWWALL
Photo No.	Signed . The Address for RTC
	R. T. CROWELL, LA
	ORD. ENG.
CONFIDENTIAL	
SECURITY INFORMATION 12	



in photo. 11 sec. delay 7-1/2 sec. delay actuator 2-1/2 sec. delay actuator Me chanism Body Arming Shear Fire Detonator Rotor

CONFIDENTIAL, SP.CURITY INFORMATION Flectric Bomb Fuze-Ex-200 Mod 3. View: Mechanical Component Block. Figure 2



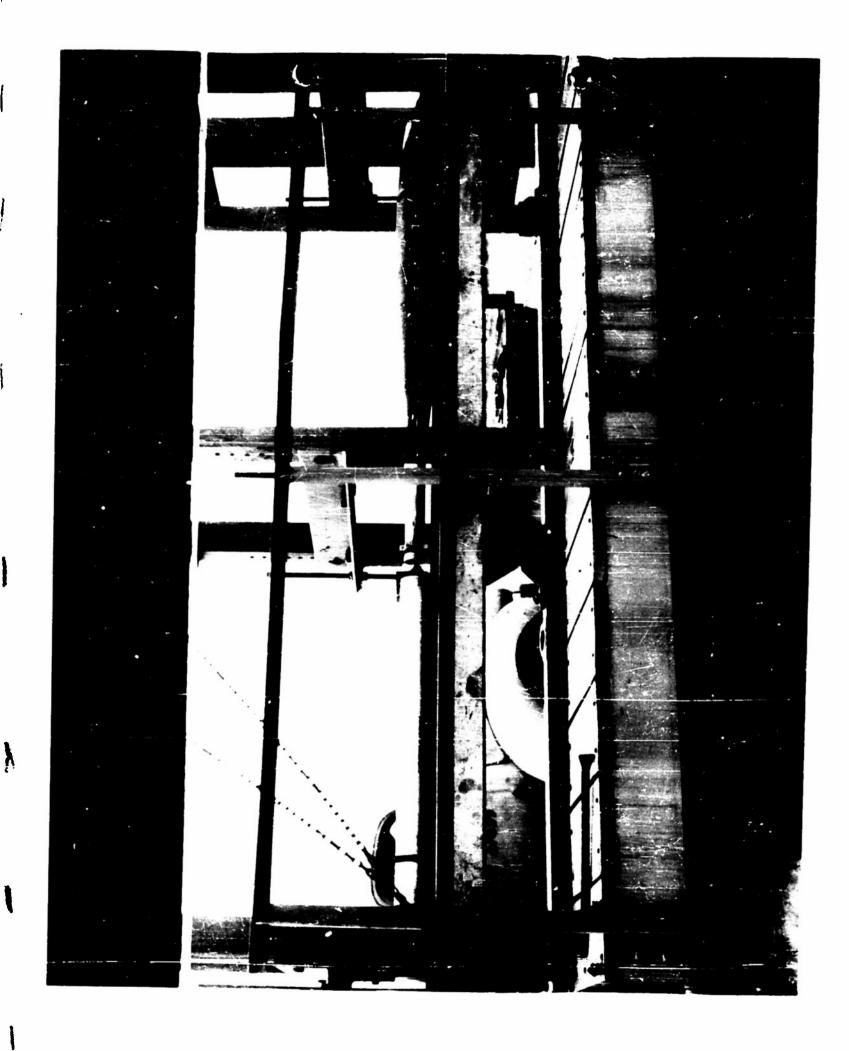


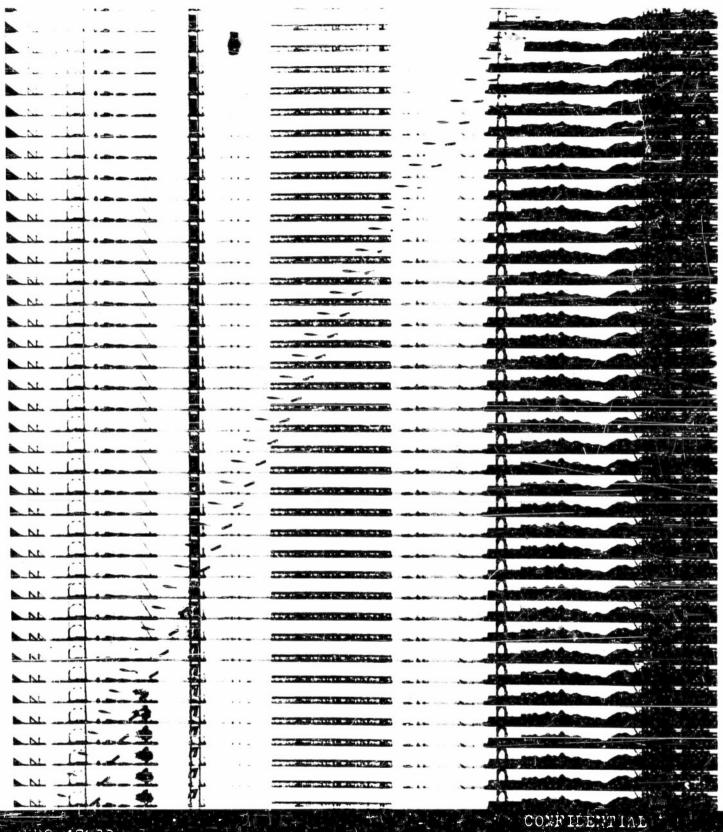
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STATE AND PERSONS

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SECURITY INFORMATION Electric Bomb Fuze Ex-200 Mod 3. View: Typical Sensitivity Test Shot with fuze in 250 lb. Low Drag Bomb Ex-2 fired from MPG 500 ft. louncher. Bomb propelled by three 5.0 MVAR motors in special carriage. Separation of tained by use of 3.35 motor 26.7 in tail of bort. Note separation of tomb and carriage and fuze action approximately 20 ft. beyond target.

WF9-50752

Slectric Bomb Fuze EX 200 Mod. 3. View: Typical Reavy impact test shot with fuze 250 lb. G. i. bomb fired from NFG 500 ft. launcher with three 500 Mod. Motofs. (Figure 7)

			200 (20)	
7 - 7	D N-			

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Rocket Launcher Tests of Electric Bomb Fuze EX-200 Mod 3

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